



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/694,030	10/28/2003	Ji Yong Park	1514.1033	3879

49455 7590 04/28/2006

STEIN, MCEWEN & BUI, LLP
1400 EYE STREET, NW
SUITE 300
WASHINGTON, DC 20005

EXAMINER

LANDAU, MATTHEW C

ART UNIT	PAPER NUMBER
----------	--------------

2815

DATE MAILED: 04/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/694,030

Applicant(s)

PARK ET AL.

Examiner

Matthew Landau

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 March 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4, 6, 7 and 24-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-4, 6, 7 and 30-32 is/are allowed.
- 6) ☒ Claim(s) 24, 25, 27-29 and 33 is/are rejected.
- 7) ☒ Claim(s) 26 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 January 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Drawings

The drawings were received on January 26, 2006. These drawings are acceptable.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 24, 25, 27, 28, and 33 are rejected under 35 U.S.C. 102(e) as being anticipated by Oana et al. (US PGPub 2003/0071312, hereinafter Oana).

Regarding claim 24, Figures 3-5 of Oana disclose a polycrystalline silicon thin film comprising primary grain boundaries, wherein adjacent ones of the primary grain boundaries are not parallel to each other, wherein an area surrounded by the primary grain boundaries (see attached marked-up version of Figure 5) is larger than $1\mu\text{m}^2$, and wherein polycrystalline silicon grains extend to the primary grain boundaries from an amorphous silicon portion in the area.

The attached marked-up version of Figure 5 is provided to clearly demonstrate what the Examiner considers to be the primary grain boundaries (darkened lines) and the area surround by those boundaries. As indicated in Figure 5 (along with Figure 3), the crystal grains grow radially

Art Unit: 2815

outward from the non-crystallized portions. Oana discloses the starting material for the semiconductor film is amorphous silicon (paragraph [0026]). Therefore, any region that has not been crystallized is amorphous. Note that the area indicated in attached Figure 5 shows that a Emin point is in the center of the area. Since the Emin point is below the crystallization threshold (as indicated in Figure 4), that region remains amorphous. Although Oana repeatedly uses the terminology “single-crystalline” to describe the obtained semiconductor film, the film still has a plurality of crystal grains (albeit, larger grains). Therefore, the film is by definition polycrystalline film. Since the film is actually a polycrystalline film, the grains within that film can be considered polycrystalline grains. As can be seen from Figure 6, each side of the crystal grains (the primary grain boundaries) has a length of $2\text{ }\mu\text{m}$. Therefore, the area surrounded by the primary grain boundaries must be larger than $1\text{ }\mu\text{m}^2$.

Regarding claim 25, the attached marked-up version of Figure 5 shows the primary grain boundaries are formed in a closed polygonal shape.

Regarding claim 27, the attached marked-up version of Figure 5 shows the primary grain boundaries are symmetrical to each other centering around a vertical axis that passes through the middle of the area.

Regarding claim 28, Figure 6 of Oana discloses the film is used in a TFT.

Regarding claim 33, Figure 5 of Oana discloses each of the primary grain boundaries is a boundary where polycrystalline silicon grains grown in different directions meet (see rejection of claim 24 above for further explanation). Note that the arrows in Figure 5 show the direction of grain growth. Therefore, the grain boundaries shown in Figure 5 are clearly the point at which grains grown in different directions meet.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 29 is rejected under 35 U.S.C. 102(e) as anticipated by Zhang or, in the alternative, under 35 U.S.C. 103(a) as obvious over Akimoto et al. (US PGPub 2003/0197666, hereinafter Akimoto) in view of Oana.

It is unclear if the limitation “used in an organic electroluminescent display device” is a recitation of intended use or if the limitation positively claims a display device. Using the broadest reasonable interpretation, it is considered the limitation “is used in an organic electroluminescent display device” is merely a recitation of an intended use of the claimed thin film transistor. The TFT of Oana (Figure 6) is capable of being used in an electroluminescent device therefore the claim is anticipated. Assuming, *arguendo*, that the organic electroluminescent display device is positively claimed and must be present in order to have anticipation, the claim would still be obvious over Akimoto in view of Oana. Figure 1 of Akimoto discloses an electroluminescent device comprising a TFT with a polycrystalline silicon thin film active layer (page 3, paragraph [0037]). Oana discloses a TFT with the properties of

Art Unit: 2815

claim 1 (see above). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify Akimoto by using the TFT of Oana for the purpose of using TFT having reduced variety of threshold value and stable operating characteristics (paragraph [0011] of Oana).

Allowable Subject Matter

Claims 1-4, 6, 7, and 30-32 are allowed.

The following is an examiner's statement of reasons for allowance:

Regarding claim 1, the prior art of record, either singularly or in combination, does not disclose or suggest the combination of limitations including wherein grains of polycrystalline silicon extend in a plurality of directions in the area from each of the primary grain boundaries, and wherein the area does not contain any substance added to promote crystallization of silicon in the area.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Claim 26 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

Applicant's arguments filed January 26, 2006 and March 1, 2006 have been fully considered but they are not persuasive.

Applicant argues that "The Examiner also apparently considers Figure 5 of Oana to disclose the feature "wherein polycrystalline silicon grains extend to the primary grain boundaries from an amorphous silicon portion in the area" recited in claim 24, although the Examiner did not explain why he considers this feature to be shown in Figure 5 of Oana". It is noted that the Examiner cited Figures 3-5, not just Figure 5. Also, the Examiner did explain how the claim limitations read on the disclosure of Oana, and even went as far as to provide a marked up version of one of drawings. In lines 1-5 of page 10 of the response, Applicant admitted that the center portion of the area indicated shown in the marked up copy Figure 5 is in fact amorphous silicon. Specifically, Applicant stated "The areas between the minimum intensity point Emin and the melting threshold intensity point Emth do not melt and thus do not crystallize, thereby remaining non-crystalline silicon portions, i.e., amorphous silicon portions". In view of this admission, and in light of Applicant's additional arguments, it is clear that main point of contention is whether or not the boundaries shown in Figure 5 (highlighted in the marked up version) can be considered "primary grain boundaries". Applicant has submitted an amendment to the specification defining a primary grain boundary as "a boundary where polycrystalline grains grown in different directions meet." The Examiner would first like to point out that a polycrystalline material is a material that contains more than one crystal grain.

Art Unit: 2815

The grains within the polycrystalline material can be considered “polycrystalline grains”, since they make up a polycrystalline material. This is the only possible interpretation of “polycrystalline grains”, since the grains themselves are single crystal. If Applicant is attempting to apply a special meaning to “polycrystalline grains”, the phrase must be explicitly defined in the specification, since that would go against the ordinary meaning of the term “grain” as known in the art. Turning to the Oana reference, Figure 5 shows a plurality silicon grains. By definition, the film in which the grains reside must be considered a polycrystalline silicon film, since it contains more than one crystal grain. Therefore, the grains shown in Figure 5 are polycrystalline silicon grains. As indicated in Figure 5, the grains are grown in different directions. The boundaries highlighted in the marked version, which the Examiner calls “primary grain boundaries”, are at the point in which the grains meet each other. The grains that meet each other at these boundaries are grown in different directions. Therefore, the Figure 5 of Oana clearly discloses polycrystalline silicon grains grown in different directions meet at the boundaries highlighted in the marked up version. Based on the definition provided by Applicant, these boundaries are in fact “primary grain boundaries”.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is (571) 272-1731.

The examiner can normally be reached from 8:30 AM - 5:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Kenneth Parker can be

Art Unit: 2815

reached on (571) 272-2298. The fax phone numbers for the organization where this application or proceeding is assigned are (571) 273-8300 for regular communications and (571) 273-8300 for After Final communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should any questions arise regarding access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Matthew C. Landau

April 27, 2006